(2)

DLA-90-P90123

Termination for Convenience Decision Support Model

OPERATIONS RESEARCH AND ECONOMIC ANALYSIS OFFICE

DEPARTMENT OF DEFENSE

DEFENSE LOGISTICS AGENCY

1990

DLA-90-P90123

Termination for Convenience Decision Support Model

Prepared by

Thomas L. Brooks IV
Capt Michael A. Ryan, USAF

DEPARTMENT OF DEFENSE

DEFENSE LOGISTICS AGENCY

OPERATIONS RESEARCH AND ECONOMIC ANALYSIS OFFICE
CAMERON STATION,
ALEXANDRIA, VIRGINIA 22304-6100

September 1990

DEFENSE LOGISTICS AGENCY
HEADQUARTERS
CAMERON STATION
ALEXANDRIA, VIRGINIA 22304-6100

D. LO

FOREWORD

The General Accounting Office, National Security and International Affairs Division indicated, in their report, "Defense Inventory: The Defense Logistics Agency's Excess Materiel On-Order," (GAO/NSIAD Report 90-105, March 1990), that the Defense Logistics Agency's (DLA) policies and procedures were not effective in canceling or terminating procurements for material considered excess to current requirements.

The DLA Operations Research and Economic Analysis Management Support Office was requested by the DLA Contracting Directorate and the Directorate of Supply Operations, to review existing policies and procedures and to determine under what circumstances it is cost effective to cancel or terminate excess procurements.

This report summarizes the current policies and describes an analytic model which: (1) standardizes and streamlines the termination process; (2) gives visibility of depot storage and handling costs; (3) identifies candidates for economic termination; and (4) if implemented, would reduce the value of excess on-order material and avoid unnecessary storage and handling costs. Keywords: Logistics, Material Requirements, Procurement, Cancellation, Policies, Cost Effectiveness, Models, Termination, Supply, Depots, Visibility

J.R. MARSHALL
Colonel, USAF
Acting Deputy Assistant Director
Policy and Plans

Handling Costs, Cost analysis, Order Statistics, Value, Storage Costs. (EMK)

CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

The Defense Logistics Agency (DLA) uses forecasting methods that generate procurements for material which may later be considered excess to requirements. If these over-procurements are detected prior to actual receipt, an opportunity exists to cancel or terminate the procurements and thereby avoid certain storage and handling costs. In addition, funds which would be tied up in excess stock can be released and used for the purchase of other material. The General Accounting Office (GAO) estimated that the value of DLA's excess on-order material was significant and, it was agreed that this problem would be examined and changes made to reduce and then control the excess on-order material.

The DLA Operations Research and Economic Analysis Management Support Office was tasked with the project of reviewing the current policies and procedures, examining two existing computer models which could be used to structure the termination process and then either developing a new model or modifying one of the existing models for use, Agency wide. This report contains a review of the existing policies, a review of the two existing models, and a description of a new model developed for Agency use.

The policies which were used to guide the termination process did so by limiting those terminations which could be forwarded from supply to procurement. In general this was done through the use of either a contract value or an expired lead time threshold. If a procurement was below the dollar threshold, or if the number of days until delivery was less than that specified, then the procurement was not a candidate for termination. These thresholds were found to greatly reduce the number of terminations sent to procurement, however, neither type of threshold could be used to effectively identify procurements as being either economic or non-economic terminations.

Certain minor flaws were found in the methodology of the existing computer models - primarily, the manner in which avoided storage costs were computed. In addition, it was determined that integration with existing automated systems was necessary and that this task would be much more difficult for the existing models. The computer model that was developed incorporates an alternative method of computing storage costs and extracts much of the needed data from other data processing systems.

Testing of the new model prototype has been completed at the Defense General Supply Center (DGSC) and implementation at each of the Supply Centers is scheduled to start in late Summer 1990. Complete implementation is expected by the Fall of 1990. Initial results of prototype testing at DGSC indicate that if the model were fully implemented, then DGSC's procurements for excess on-order material could be reduced by about $160 million and that reduced storage costs would be $16 million. No extrapolation was made to determine agency wide savings.

Modifications to adapt the model to the peculiarities of the Medical and the Clothing and Textile Commodities are also discussed and these modifications should be completed by January of 1991.

I. INTRODUCTION

A. Background. The General Accounting Office, National Security and International Affairs Division (GAO/NSIAD) has twice criticized the Defense Logistics Agency (DLA) for failing to promptly cancel or terminate procurements for material considered excess to current forecasts of demand (GAO/NSIAD Report 84-42, "The Defense Logistics Agency Could Better Identify and Cancel Unneeded On-Order Materiel," January 1984 and GAO/NSIAD Report 90-105, "Defense Inventory: The Defense Logistics Agency's Excess Materiel On-Order," March 1990). In the latter report, they estimated that the value of the excess on-hand material exceeded $3.5 billion and that the value of excess on-order material exceeded $900 million. The GAO was also critical of DLA's procedures and policies which guide the termination process. Although DLA was critical of the methods and assumptions used by the GAO, DLA agreed to investigate the problem.

B. Purpose. The DLA Contracting Directorate (DLA-P), in conjunction with the Directorate of Supply Operations (DLA-O), requested that the DLA Operations Research and Economic Analysis Management Support Office evaluate the excess on-order situation, review existing policies and procedures, and determine under what circumstances it is cost effective to terminate contracts or cancel purchase requests for excess on-order material.

C. Objectives. The GAO expressed concern that the current policies do not consider either the costs of accepting and then holding excess on-order material or the administrative costs to cancel or terminate the procurements. The study objectives were to determine which costs were pertinent and how these costs should be compiled to calculate the economic impact of termination.

D. Scope. This analysis included a review of the policies and procedures as supplied by DLA's Directorate of Supply Operations, Supply Management Division (DLA-OS) and a review of two existing termination models, the Navy's Contract Termination Processing Model and the Contract Termination Model as developed by the Defense Electronics Supply Center (DESC).

II. CONCLUSIONS

Based upon a review of the two computer models and of the current policies and procedures, the study conclusions are as follows:

* Regardless of possible future improvements to DLA's forecasting system, the value of the excess on-order material will continue to be of some magnitude, and there will continue to be a need to determine the economic impact of terminating procurements for this material.

* Dollar value and elapsed time thresholds cannot be used to identify procurements which can be economically terminated or canceled.

* Economic terminations can only be identified if the cost to purchase and hold the excess material, is compared to the cost to terminate the procurement and then re-buy the material later. Determining these costs and when to apply them is tedious and complex. A computer model would simplify and standardize this process.

* For many items with excess on-order material, more than one specific procurement could be selected for termination or reduction. We were not able to find a method (other than trial and error) which would identify those procurements with the greatest possible termination savings.

* No major shortcomings were found in the review of the two existing computer models. However, use of either required extensive data entry. Because each model was designed as a "stand-alone" application, major rework would be required to link either model with existing automated systems.

III. RECOMMENDATIONS

Since (1) dollar or elapsed time thresholds do not identify economical terminations; and, (2) the calculation of termination savings is complex; and, (3) the generation of procurements for excess material will continue regardless of possible improvements to the existing forecasting system, it is recommended that an analytic model be developed and integrated into the Standard Automated Material Management System (SAMMS) for the purpose of assisting the Inventory Manager in calculating the economic consequences of terminating excess on-order procurements.

The inability to estimate which contracts will yield the greatest termination savings could be resolved if the vendor fees for terminating the various contracts were known at the time that the excess position was identified. One possible solution is to compile historical data and attempt to correlate the vendor's termination fees to variables such as contract value, elapsed lead time, etc.

IV. BENEFITS. The primary, quantifiable benefit of developing an analytic model to assist the inventory manager is the reduction in the volume and value of the excess on-order inventory. Reducing this inventory does two things; first, it frees up limited stock fund dollars for purchases of other items, and second, it reduces depot storage and handling costs. Based upon an analysis of a model prototype developed for the Supply Operations Management Support Office at Defense General Supply Center (DGSC), it was estimated that the full implementation and integration (at DGSC) would result (over some several years) in a reduction in the value of the excess-on order material by over $160 million. In addition, there would be a reduction in depot storage and operating costs which would have a present value of about $16 million. A non-quantifiable benefit of a fully integrated model is that it would provide a standard methodology for the review of excess on-order material (see Appendix A).

V. IMPLEMENTATION

Based upon the results of the DGSC prototype, a model suitable for use at each of the Hardware Centers (DESC, DGSC, Defense Construction Supply Center (DCSC), Defense Industrial Supply Center (DISC)) is being developed. This model is currently scheduled for full implementation at all of the Hardware Centers by the end of the current fiscal year. Implementation will be phased, with the first center (DGSC) scheduled for June of 1990.

Two other modifications are currently being developed. The first is for items with shelf life constraints, applicable at all Centers but a primary consideration for the Medical Commodity. The second is for items purchased under "group buys," primarily for the Textile Commodity, but also of some collateral interest to the teams developing the concept of Commodity Oriented Purchasing. These modifications are planned to be completed and the models implemented by January of 1991.

VI. ANALYSIS

A. Current Policies

Each Hardware Supply Center's policies (as of 20 July 1988) regarding contract termination decisions are outlined briefly below:

* Defense Construction Supply Center

  The contract value must exceed $25,000.
  No more than one half of the production lead time may have expired.
  The value of the goods to be terminated must exceed $10,000.

* Defense Electronics Supply Center

  The contract value must exceed $1,000.

* Defense General Supply Center

  The termination fee charged by the vendor must be less than one-half of the contract value.

* Defense Industrial Supply Center

  The contract value must exceed $250.
  Delivery must be scheduled at least 30 days in the future.

The GAO indicated that the contract value thresholds were too high. At DCSC, the $25,000 threshold excluded 98.5 percent of the potential contracts for termination. The GAO also indicated that DLA had a history of failing to terminate contracts when vendor termination costs were involved.

During the period from November 1989 until April of 1990, the DGSC Inventory Managers using the prototype model developed by this office, attempted cancellation of thirty contracts with a total termination value of $367,504 and a potential savings of $209,898. Of these, ten were actually canceled. These canceled contracts were valued at $77,487 and the termination savings were calculated at $72,349.

A policy letter was issued by the Logistics Program Division of DGSC-O on 5 April 1990. The policy described in this letter instituted a termination value threshold of $10,000. Had the policy been in effect during the period of the prototype test, sixty percent fewer contract terminations would have been attempted. However, the value of the terminations not attempted would have been $23,425 and the missed savings would have been $14,676 (Table 1).

Table 1

CONTRACT VALUES AND DOLLAR SAVINGS

	Actual Results	Under New Policy	Change
Attempted Cancellation			
Number of Contracts	30	12	-60.0%
Contract Value	$367,504	$262,933	-28.5%
Potential Savings	$208,898	$118,011	-43.5%
Actually Canceled			
Number of Contracts	10	6	-40.4%
Contract Value	$77,487	$54,062	-30.2%
Savings	$72,349	$57,673	-20.3%

If a $25,000 termination value threshold had been instituted, no contracts would have been terminated. As illustrated, a contract value threshold can be used to control procurement workload. However, its use causes many potentially economical terminations to be bypassed.

B. Review of Existing Models

In general, the methodology used by the existing computer models consists of mapping the excess material in terms of a two dimensional array, one axis being quantity and the other time (Figure 1). Three points can be used to define this region and the region's area can be used to calculate the cost to store the excess goods.

To use this methodology, the excess stock must be able to be represented by the triangle *abc* and the assumptions must be made that (1) the termination quantity can be represented by the distance between points *a* and *b*, (2) the stock level over time which results from termination can be represented by the horizontal line *ac*, and that (3) the stock level over time which results from non-termination can be represented by the line *bc*.

With linkage to existing automated systems, many more parameters are available for use in calculating the quantity of excess stock. Determining the triangle *abc* using these parameters was examined at some length, and although this transformation would have been an elegant solution, it was determined that it was not possible to accurately define the excess material with a triangle.

Figure 1

CURRENT METHODOLOGY

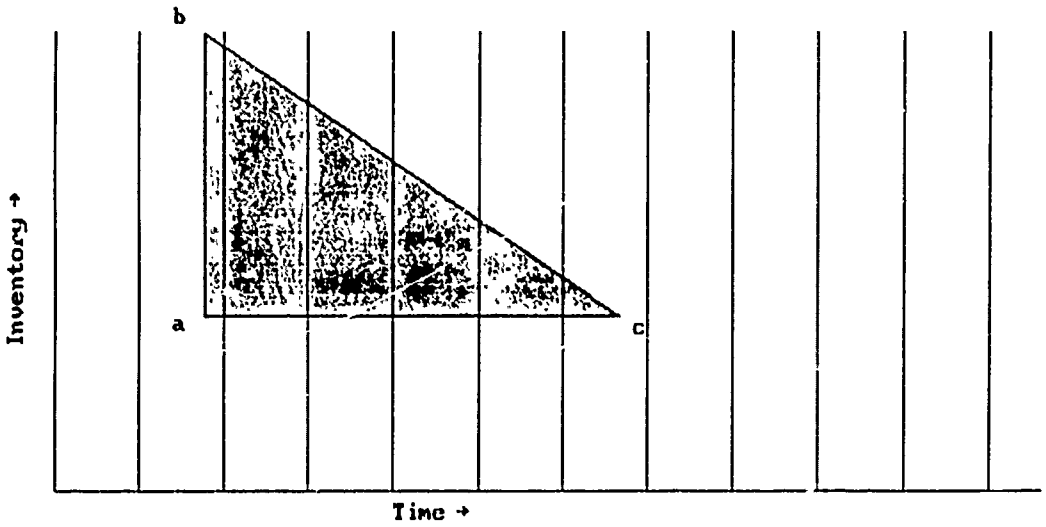

Figure 1: A triangle can be used to calculate the storage costs of the excess material. Point a is defined as the stock on-hand at the time that the terminated procurement would have been received. The distance between points a and b represents the quantity of goods to be terminated and the distance between points a and c represents the amount of time to draw the excess quantity down to the original stock level (the excess quantity divided by the demand).

For example, the inventory balance which results from termination (line *ac* in Figure 1) should also be subject to draw down by demand. This indicates that a sloping line, like line *ac1* in Figure 2 is more appropriate. Furthermore, if a termination is processed, re-buy(s) should be made sooner than would otherwise occur. When the goods from these re-buy(s) are received, the inventory balance should increase, as at points *c1* and *c2* in Figure 2. To represent the non-termination stock level over time with a line (like *ac* in Figure 1) requires two assumptions. First, that the line *ad* (in Figure 2) coincides with the item's reorder point level, and second, that storage costs are only incurred on inventory balances above this level.

Another problem occurs if the termination of multiple procurements with differing delivery dates is considered. If this occurs, then the distance between points *a* and *b* does not represent the quantity to be terminated and the straight line *bc* does not represent the stock level over time if the procurements are not terminated.

Discussions of the DESC Termination Model were held with DESC Functional Analysts responsible for evaluating the model's usefulness. Their only criticism of the model was that a large amount of data entry was required to process each procurement to be terminated. An examination of the Navy's model revealed that it, too, would require a large amount of data entry.

Figure 2

PROPOSED METHODOLOGY

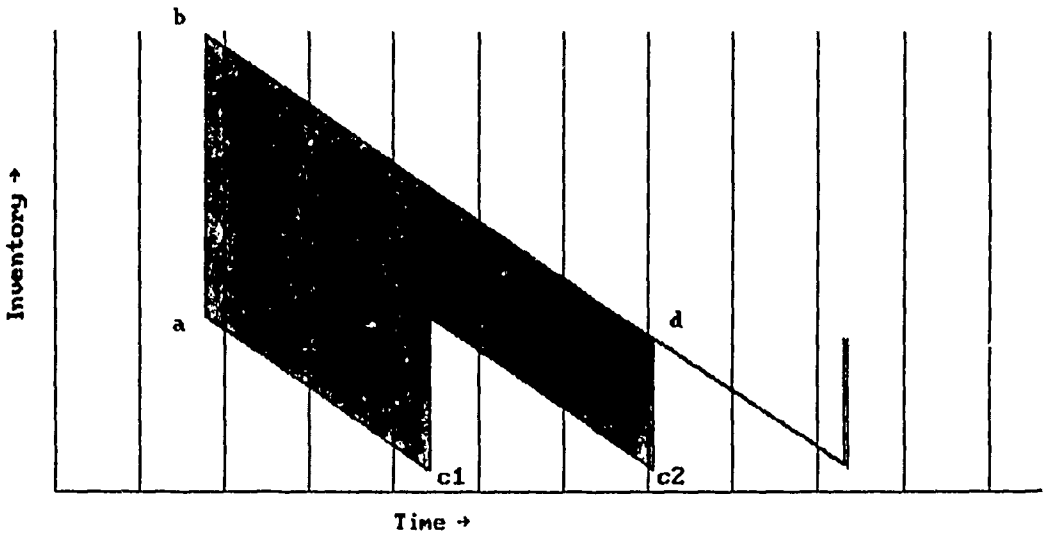

Figure 2: The data available on the linked automated systems allows the definition of a polygon which can be used to calculate storage costs. Points **a** and **b** are defined as in Figure 1. If the quantity **ba** is terminated, two re-buys will occur (at points **c1** and **c2**). The excess quantity is represented by the shaded area.

An estimate of the impact of improved forecasting methods was then made. At DGSC, the current level of approved recommended buys is approximately forty million dollars per month. If improvements to DLA'S forecasting methods were able to reduce the forecasting error to only five percent, over-forecasts of demand would be expected to be 2.5 percent. If 2.5 percent of the forty million dollars in approved buys are based upon over-forecasts of demand, then, each month, one million dollars worth of excess procurements would be generated. Given a typical total lead time of nine months, the total value of the excess on-order material would be expected to be nine million dollars. While this is very much less than DGSC's current level of $25-35 million in excess on-order material, the economic impact of terminating those procurements would still need to be determined.

Given the data entry requirements of the current models and given the continued existence of a large number of procurements for material considered excess to current requirements, it was determined that a model, which would interface and link with existing automated systems, would reduce data entry requirements Agency wide and streamline the termination decision process. The balance of this report describes a review of the termination decision, a review of a model which more accurately captures storage costs, and a description of a system prototype which links the model with existing automated systems.

C. Termination Decision Overview

Determining the proper sequencing of decisions was the most critical problem in considering the termination of excess on order procurements. The first -- and most important -- decision was the confirmation that a given item was in fact overstocked. This required an accurate estimate of future demand, a verification of the reorder point calculations, and the confirmation of procurement due-in dates. After excess position was confirmed, the economics of termination was considered. To estimate the economic impact of termination, all variable costs which DLA incurred in processing a termination were included. In addition, the timing of these costs was estimated to allow for the time value of money and the opportunity cost associated with having excess stock. These calculations generated a breakeven point. If all internal costs were captured, and if the calculations resulted in zero savings, DLA should have been "indifferent" to the results of the Inventory Manager's decision (see Figure 3).

Figure 3

DECISION DIAGRAM

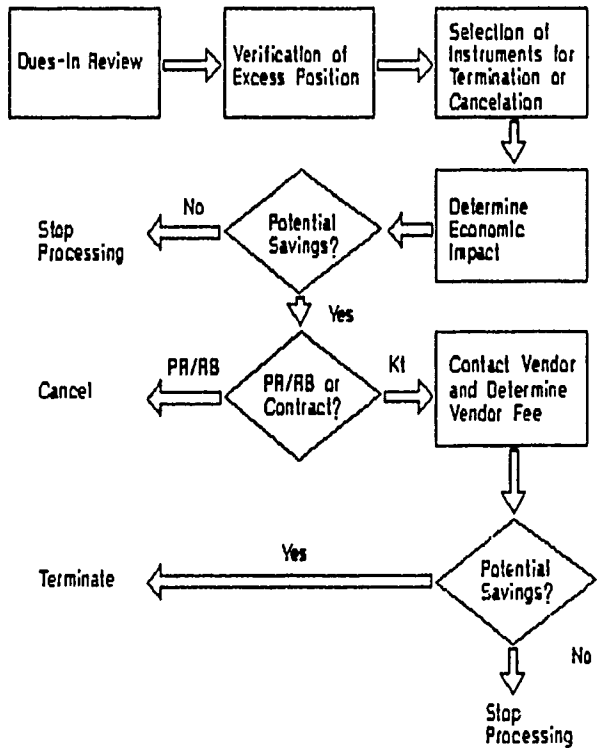

Figure 3: Diagram of the termination process from the initial identification of excess position through cancellation or termination.

The Inventory Manager's termination decision involved procurements in one of two stages. The first stage included procurements which were Recommended

Buys (RBs) or Purchase Requests (PRs). RBs and PRs could be canceled prior to award and therefore could be canceled without incurring any costs external to DLA. Termination of a procurement which had reached the second stage, an awarded contract (Kt), could incur external costs associated with the vendor's estimated termination settlement proposal for releasing DLA from the remaining portion of the contract. For a given Kt, if the external cost exceeded the calculated termination savings, then the termination was considered uneconomical.

D. Model Overview

In order to develop the polygon described in Figure 2, two inventory systems were modeled and a comparative cost analysis was used to determine the economic consequences of choosing one system instead of the other. The first inventory system (Inventory System 1 in Figure 4) assumed that no termination action was taken and that excess material was allowed to enter the system and was used to define the line *bd* (Figure 2). The second system (Inventory System 2 in Figure 4) modeled an inventory system with terminated procurements and defined the line *a-cl* (Figure 2).

Figure 4

TERMINATION MODEL OVERVIEW

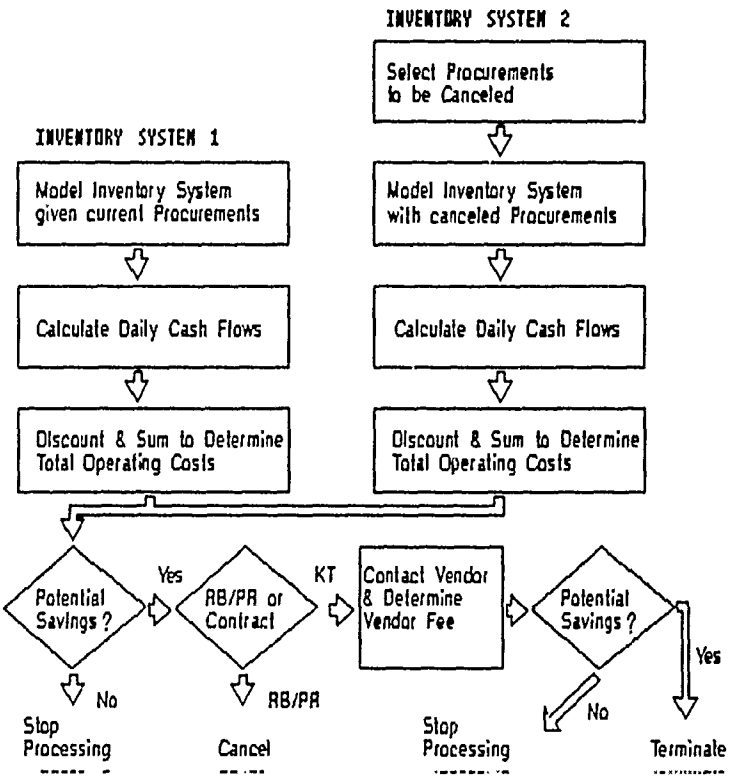

Figure 4: The calculation of potential savings required the modeling of two inventory systems. The first model was based upon the assumption that all outstanding procurements would be received on their due dates. The second was based upon the termination of a subset of the current outstanding procurements.

1. Inventory System 1

Wilson's Economic Order Quantity Model was used to calculate the daily inventory balances of this system. The parameters downloaded from SAMMS, i.e., forecast of demand, economic order quantity, reorder point, etc. (see paragraph VI.F., section G for a complete list), were used to model the inventory system and to predict the system's costs. The demand drew the inventory level down and procurements increased the inventory level on the dates that they were due-in. When the demand drew down the inventory level such that the reorder point was reached, an order was placed. The order quantity was equal to the SAMMS value for an economic order quantity and the delivery date was the reorder date plus the lead time.

As indicated, the inventory system was modeled given that all outstanding procurements are actually received. In general, this means that the inventory model started out in an "over-procured" asset position. Except for items with a very low forecast of demand, the inventory levels would eventually be drawn down such that the reorder point was crossed, an order was placed and then, the inventory system moved into a typical 'sawtooth' equilibrium position (Figure 5).

Figure 5

ASSET BALANCES

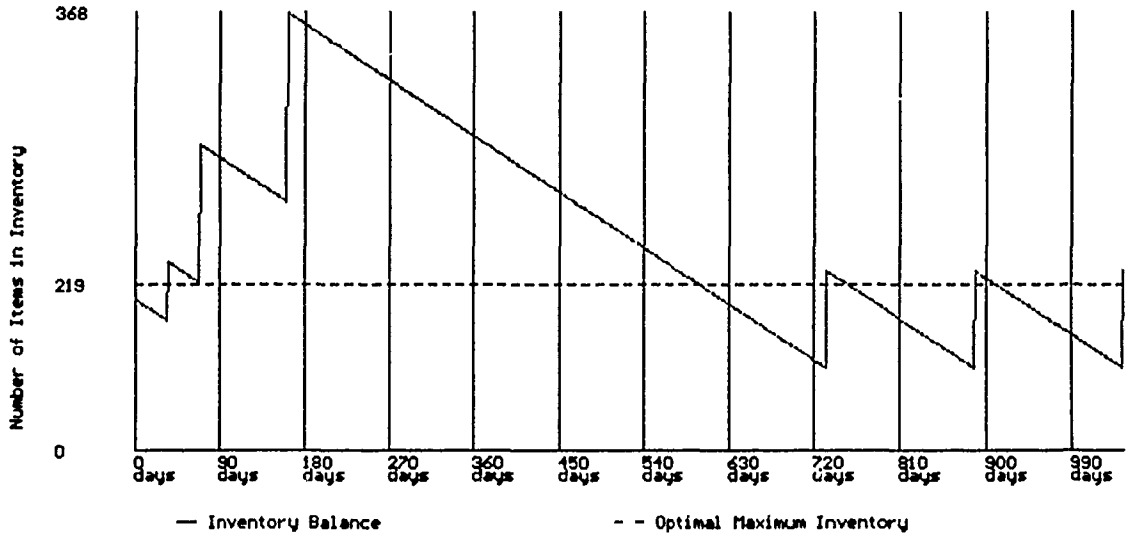

Figure 5: Model of Inventory System with Excess-On-Order Material scheduled for receipt throughout the first 180 days. After day 720, the system displayed a typical sawtooth pattern as deliveries were received and demands were met.

The second step was to develop the expected daily cash flows predicted by the model. For example, if the reorder point was breached, then on that day, a cash out-flow occurred which was equivalent to the center's administrative cost to place an order. To derive the values for these costs, "The

Multiple Cost EOQ Study" published by Synergy, Inc. in December of 1989 was used. This study was performed under contract for DLA and derived the specific administrative costs of awarding contracts. These costs were developed for each of the various procurement methods and procedures used by DLA. The costs for DGSC are shown in Table 2.

Table 2

THE ADMINISTRATIVE COST TO PROCURE AT DGSC ($)

Center Labor Costs	SASPSI(1)	SASPSII(2)	ICP-Small(3)	DCMC-Small(4)	Large(5)
PR Processing Costs					
Item Manager Review	5	5	5	5	5
Technical Review	1	1	1	1	1
Quality Assurance	1	1	1	1	1
Purchasing Costs					
Recording and Processing PR	1	1	1	1	4
Solicitation	7	4	9	9	25
Technical Referral	1	1	9	9	21
Evaluation and Award	0	10	13	13	58
ceipt and Payment Costs					
.ost Award					
File Management	0	0	1	1	5
Production Follow-up	3	3	8	8	13
Depot Receiving					
Material Receiving	3	3	3	3	3
Material Inspection	2	2	2	2	2
Packaging, Preservation & Maintenance of Material	0	0	0	0	0
Movement to Warehouse	1	1	1	1	1
Processing Receipt Document	1	1	1	1	1
Payment	2	2	2	2	2
Contract Administration Costs					
Preaward Survey	0	3	3	3	38
Contract Admin. & Quality Ass.	0	0	0	579	718
Source Inspection	0	0	0	164	164
Payment	0	0	0	15	15
Benefit Costs					
Personnel Benefits	5	6	10	10	26
Leave Entitlements	10	12	20	20	50
Indirect Support	2	4	4	4	22
Total	$45	$61	$95	$853	$1,174

1). SAMMS Automated Small Purchase System (SASPS) I - Purchases against Blanket Purchase Agreements or Indefinite Delivery Contracts whereby calls for deliveries were made automatically by SAMMS.

2). SAMMS Automated Small Purchase System II - Automated Purchases System where solicitations were generated automatically by SAMMS for certain procurements less than $25,000.

3). Small Manual Purchases with contract administration performed by the Inventory Control Point (ICP) were certain purchases less than $25,000 not using one of the two automated methods.

4). Small Manual Purchases with contract administration performed by the Defense Contract Management Command (DCMC) were all purchases less than $25,000 not using one of the two automated methods and not locally administered.

5). Large Purchases were all other procurements.

See "Multiple Cost EOQ Study", December, 1989, by Synergy Inc. for details regarding the derivation of these costs.

Based upon discussions with functional analysts from the DGSC Contracting Directorate (DGSC-P), the costs in Table 2 were segregated into costs that occurred at the time of award, costs that occurred at receipt, and costs

that occurred throughout the contract lead time. The breakout at DGSC is displayed in Table 3.

Table 3

TIMING OF ADMINISTRATIVE COSTS

Costs Incurred at time of Ordering	Costs Incurred at time of Receipt
PR processing costs	Depot receiving costs
Purchasing costs	Payment costs
Preaward survey costs	Source inspection costs

* All other costs were assumed to occur throughout the life of the contract and were modeled as if 1/3 were ordering costs and 2/3 were receipt costs.

Each Center's storage and obsolescence costs were also reported in the "Multiple Cost EOQ Study." In 1989, these costs for DGSC were one percent and six percent of the unit price per year, respectively. To determine the daily cash flow for these costs, the daily inventory balance was multiplied by the yearly rate and divided by 365.25.

Each day's cash flow was discounted by DLA's cost of capital (ten percent per annum as stated in the Defense Logistics Agency Manual 7041.1 "Economic Analysis," May 1985). The sum of these daily discounted cash flows represented the anticipated total operating cost of the inventory system (Figure 6).

Figure 6

DAILY CASH FLOWS

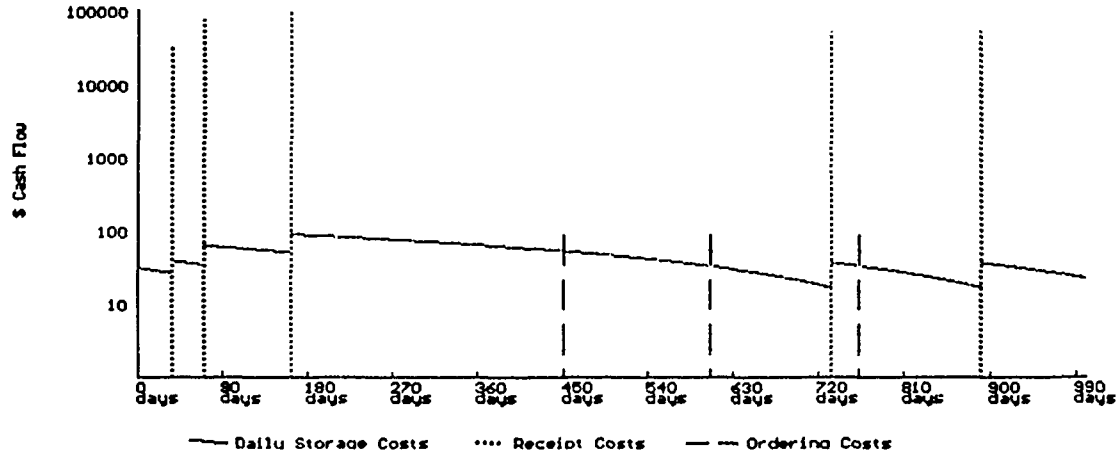

Figure 6: Estimated size and time of cash outflows as the inventory system was modeled. Note that the Receipt Costs included the payment of the contract value to the vendor.

2. Inventory System 2

To calculate the economic impact of terminating some or all of the outstanding procurements, the inventory balances and daily cash flows were recalculated (see Inventory System 2 in Figure 4). For these calculations, there was no delivery of the canceled procurement(s) (Figure 7); there was no payment for the terminated goods; and there was an overall reduction in the inventory storage costs.

Figure 7

COMPARISON OF DAILY INVENTORY BALANCES

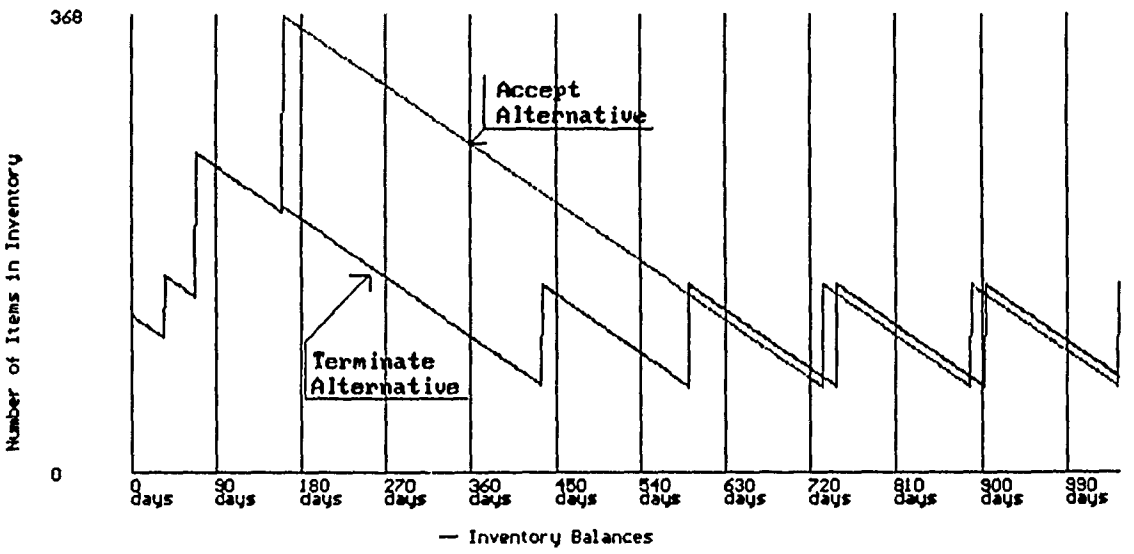

Figure 7: Comparison of Daily Inventory Balances. Termination results in much lower inventory levels from about day 180 through day 600. After that, the two systems have equal maximum and minimum inventory balances.

For many items in an excess position, only a subset of the outstanding procurements needed to be terminated. In fact, terminating all of the outstanding procurements frequently resulted in a stock outage. The model selected procurements for terminations as follows:

* Procurements were arranged in the following groups: RB/PR/Kt.

* Starting with the first group, the procurement instrument with the due date farthest into the future was selected. If the quantity recommended as excess by SAMMS was not exceeded, the entire instrument was terminated, otherwise the instrument was partially reduced.

* Selection of instruments from this group continued until the recommended quantity was met or the group was exhausted.

* Select instruments from the next group using the rules above.

This subset of instruments was not necessarily the most cost effective subset; however, it was the most likely subset where termination was feasible.

Processing the termination itself would lead to additional administrative costs. Discussions were held with DGSC-P functional analysts to determine the dollar value of these costs and they are shown in Table 4.

Table 4

ADMINISTRATIVE COST TO TERMINATE

* The small purchase PR cancellation cost was nominal - about ten dollars.

* The large purchase PR cancellation was essentially twice the cost to award a large purchase contract plus the pro-rated portion of the benefit cost or about $270.00

* Small purchase contract termination costs were equivalent to the amount allowed for Contract Modification under the Federal Acquisition Regulations (FAR) or $300.00.

* Large purchase contract termination costs were the FAR cost of $300 plus the cost to audit the vendor to determine actual performance. This last cost was assumed to be equivalent to the cost to perform a preaward survey ($1075.00). The total administrative cost to terminate a large purchase was $1375.00

The administrative cost to process a termination was modeled as if it occurred on day zero of the analysis. Each instrument to be terminated was evaluated to determine the appropriate administrative termination cost. Canceling existing procurements, for items with non-zero demand, caused at least one extra procurement (with appropriate administrative costs) at a later date. After all daily cash flows were determined, they were discounted and summed to yield the net present value of this system's total operating cost. A comparison of the daily cash flows for ordering, receiving and storing is shown in Figure 8.

Figure 8

COMPARISON OF DAILY CASH FLOWS

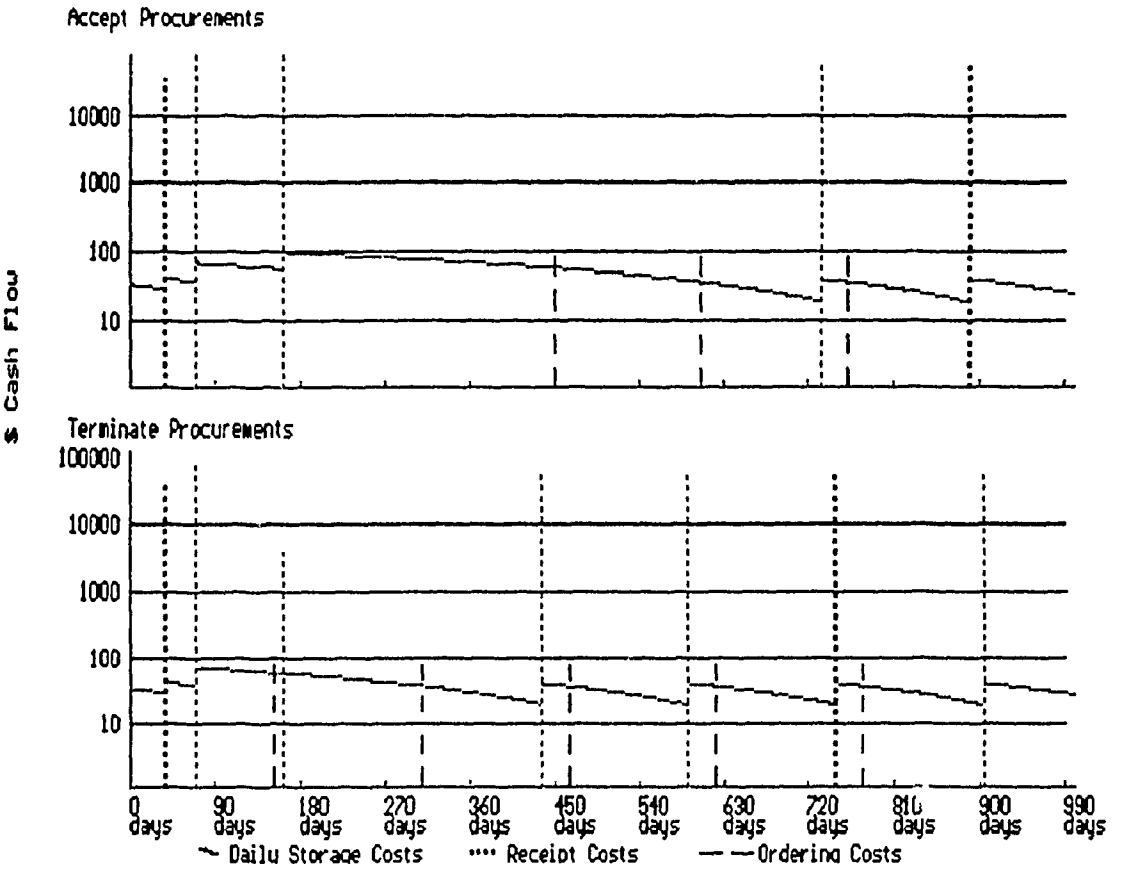

Figure 8: Comparison of Daily Cash Flows. Each scenario incurred receipt costs prior to day 90. Neither of these shipments was to be canceled. The shipment scheduled for delivery about day 180 was partially canceled resulting in lower receipt and storage costs.

3. Cost Comparison

The cost of the "accept" alternative was what DLA would have incurred if none of the procurements were canceled and all material was received on time. The cost of the "terminate" alternative (plus any vendor charges), represented the costs DLA would incur if the procurements would have been canceled. The difference quantifies the economic impact of procurement termination. An example is shown in Table 5.

Table 5

Comparison of Total 20 Year Operating Costs

Operating Costs		
Accept Excess Material	$584,504.11	
Terminate Excess Material	$583,435.82	
Total Possible Savings		$1068.29
less Vendor Fee for Contract Termination		$ TBD*
Total Net Savings		$ Unknown

* To Be Determined through negotiation with the Vendor.

Provided that the Inventory Manager did not have some relevant information which indicated that termination should not have been pursued due to non-economic reasons, PRs and RBs were canceled immediately when the indicated savings were positive. However, for contracts, the economic impact of termination could not be determined until the vendor was contacted, the termination fee negotiated and the economic impact reevaluated. Here, the indicated savings represented a break-even point. If the vendor's fee was less than or equal to the savings, the termination was considered economical. If the vendor's fee was greater than the indicated savings, the termination was considered uneconomical.

E. System Overview

To make the model available to the Inventory Manager, the method used by them to process DUE-IN Supply Control Studies (SCSs) was examined. Because the termination model required an extensive amount of data to calculate the economic impact of termination, it was necessary to integrate the model with existing automated systems to minimize the data entry required by the Inventory Manager.

Most of the necessary data was found on the DUES-IN SCS printed by SAMMS. Therefore, the initial source of this data was the file used to generate that report. Using programs which ran on DGSC's mainframe, the model extracted data from these mainframe files, created two smaller flat files and downloaded them to the Center's Distributed Minicomputer system (DMINS) (See Figure 9).

Figure 9

SYSTEM DIAGRAM

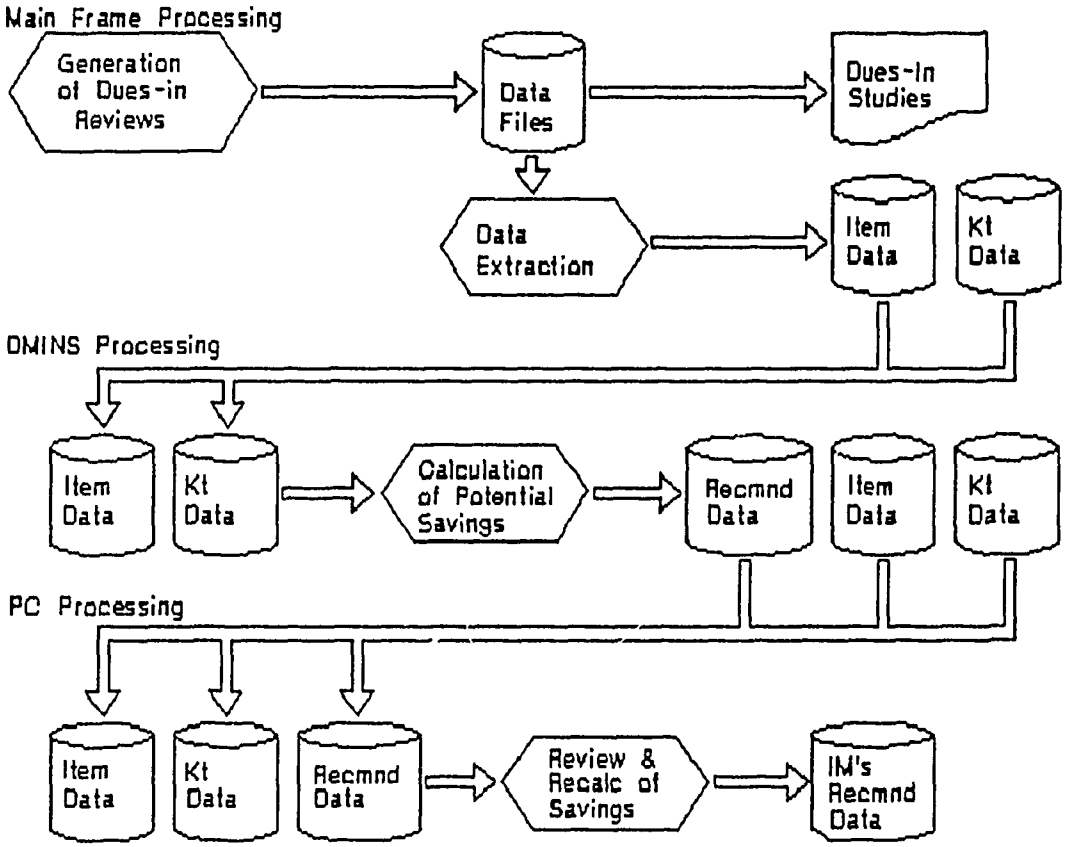

Figure 9: Diagram of information links which passed data from SAMMS to DMINS. The Termination Model calculated savings on DMINS in batch mode and the results were passed to the Inventory Manager's personal computer (PC). Another version of the model, which ran on a PC, allowed the Item Manager to review and modify the original SAMMS data, and then to recalculate the savings.

The first of these files, the Item File, contained data specific to an item. The second, the Kt File, contained data specific to an individual procurement instrument. Once these files were downloaded, a DMINS batch program calculated the termination savings for each item. These potential savings were, at that point, based upon the assumptions that the SAMMS data was correct and that the specific set of contracts or purchase request selected for cancellations was suitable. The DMINS program wrote the savings to a third flat file, the Recommendation File. This file, along with the Item and Kt Files (or subsets specific for each Inventory Manager) was then downloaded to the Inventory Manager's PC.

In using the model, the most important step for the Inventory Manager was to first confirm the excess position for each item. If the assumptions made during batch processing were correct, then the Item Manager could evaluate the calculated savings. If the Item Manager's assessment differed from that reported by SAMMS, then the Item Manager was required to enter the corrections and recalculate the termination savings. The final savings for each item was then written to a fourth file, the Item Manager's Recommendation File.

Once calculations were finalized and, for items with positive termination savings, the cancellation or quantity reduction information regarding specific contracts, purchase requests and recommended buys was passed on to procurement. Procurement was requested to cancel recommended buys and purchase requests without delay and contact the vendors for the termination of outstanding contracts. If the vendor's termination fee was less than or equal to the termination savings (and barring any other overriding circumstances), then the contract was to be terminated.

F. Sources of Data

1. Data Files. The files that contained the necessary data are described below:

* DGSC.R.R5C5601. This was an intermediate SAMMS file that was used to generate the Due-In print file. The primary data elements extracted were;

National Stock Number.
Inventory Manager Code.
Standard Unit Price.
Quarterly Forecast of Demand.
Administrative Lead Time.
Production Lead Time.
Reorder Point.
Procurement Requirements.
Cycle Requirements.
Quantity Backordered.
Total Applicable Assets.
Contract Document Number.
Contract Line Number.
Contract Line Due Date.
Contract Line Quantity.
Special Requirements.

* DGSC.P.USPA1901. The Active Contract File; the primary data elements extracted were:

Contract Number.
National Stock Number.
Commercial and Government Entity Code or Federal Supply Code of Manufacturer.

* DGSC.P.USPMAPRF. The Purchase Request File; the primary data elements extracted were:

Purchase Request Number.
National Stock Number.
Branch.
Buyer.

* GOR.TST.FSCMALL. An extract of the Commercial and Government Entity File; the primary data elements extracted were:

Commercial and Government Entity Code or Federal Supply Code of Manufacturer.
First Letter of Vendor Name

These data elements were pulled and segregated by the mainframe programs and then downloaded to DMINS. They were then used to calculate the termination savings and to route the data to the appropriate Inventory Managers and procurement personnel.

2. Other Data. Several other data elements were necessary for the calculations, but the elements were not found in any of the existing SAMMS or system files. These data elements, incorporated within the program as a part of the model, were:

* Storage Cost.
* Obsolescence Cost.
* Cost of Capital.
* Administrative Cost to Award a Contract.
* Administrative Cost to Cancel a Recommended Buy of Purchase Request.
* Administrative Cost to Terminate Contract.

G. Current Prototype Programs

Two programs were developed which ran once per month and extracted item and contract data from the SAMMS files. The first program took about 1/2 of a Central Processing Unit (CPU) minute and generated an Item File that contained about 1,000 records and required about 50 Kilobytes (KB) of storage (about $40 in CPU time per month and $10 for one month's storage). The second program took about 2 CPU minutes and generated a Contract File that contained about 5,000 records and required about 400 KB of storage ($80 CPU time and $80 for one month's storage). These two files were then downloaded to DMINS using Remote Job Entry (RJE), a standard Mainframe to Minicomputer data transfer program.

There was one DMINS program that processed the data in these two files, calculated the potential termination savings and generated a third file. This file, the Recommendation File, was also about 50KB with 1,000 records. No information is available regarding DMINS CPU time due to security restrictions.

A second DMINS program was used to generate subsets of the data in these three files. Here, three smaller files were created for each Inventory Manager. These were then downloaded to the Inventory Managers PC using KERMIT, a standard Minicomputer to Personal Computer data transfer package.

Once the data was on the Inventory Manager's Personal Computer, the data used to derive the initial estimates of termination savings was reviewed. If changes were made, the savings were recalculated on the PC. The finalized savings, along with specific procurement instrument information, was then written to a fourth file, the Inventory Manager's Recommendation File. Another PC program was developed which converted the data on the Inventory Manager's Recommendation File into a worksheet. This worksheet contained all of the data normally found on a DLA form 1128, the SAMMS data coding sheet used by Procurement to effect cancellations/terminations. Once this sheet was generated, it was sent from Supply to Procurement through the DGSC inter-office mail system.

APPENDIX A

Derivation of Estimated Benefits

Estimates of Potential Savings

In August of 1989, the Defense General Supply Center used their original policies to select contracts and purchase requests for cancellation/termination. We requested DGSC functional analysts to review their actual cancellation results (see Table A-1), and then review the termination decision model (TDM) output for that month. Next, we requested them to estimate the possible outcome had the model been in use.

Table A-1

Analysis of Due-In Data

Initial Data Downloaded from SAMMS	
# of Due-In Studies	2902
Dollar Value of Reduction Quantity	$94 million
Actual Results of Center Processing	
# of Terminations Initiated	289
Value Actually Reduced	$2 million

After their review, they estimated that about one-third of the Termination Decision Model's recommendations could be effected (see Table A-2).

Table A-2

Analysis of Termination Model Output
(assuming 33% effectiveness)

# of NSNs Reduced	913
Dollar Value Reduced	$44 million
TDM Calculated Savings	$10 million

Based upon these figures, we originally estimated that DGSC could reduce its excess on order inventory by 12 x $44.3 million = $532 million and could save 12 x 10 = $120 million. However, this overlooks the fact that some of the Due-In studies are repeats from month to month, and during each quarter, each month's studies are based upon slightly different classes of NSNs. Therefore, we decided that instead of multiplying the monthly numbers by 12, we would use 4 (the second month of each quarter covers the greatest number of NSNs, and August is the second month of the fourth quarter).

We also felt that it would be appropriate to factor the possible savings by an estimate of the fee paid the vendor to allow DLA to effect termination of contracts. Based upon the ratio of purchase requests to contracts, we felt that perhaps 60 percent of the possible savings might be spent to induce the vendors to terminate existing contracts. The results of this factoring are in Table A-3.

Table A-3

Adjusted Yearly Results

# of NSNs Reduced	3600
Dollar Value Reduced	$160 million
TDM Calculated Savings	$16 million

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	September 1990	Final

4. TITLE AND SUBTITLE
Termination for Convenience Decision Support Model

5. FUNDING NUMBERS

6. AUTHOR(S)
Thomas L. Brooks IV
Capt Michael A. Ryan, USAF

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
HQ Defense Logistics Agency
Operations Research and Economic Analysis Office (DLA-LO)
Cameron Station
Alexandria, VA 22304-6100

8. PERFORMING ORGANIZATION REPORT NUMBER
DLA-90-P90123

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Defense Logistics Agency
Cameron Station
Alexandria, VA 22304-6100

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Public Release; Unlimited Distribution

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

THE DLA OPERATIONS RESEARCH AND ECONOMIC ANALYSIS MANAGEMENT SUPPORT OFFICE WAS REQUESTED BY THE DLA CONTRACTING DIRECTORATE AND THE DIRECTORATE OF SUPPLY OPERATIONS, TO REVIEW EXISTING POLICIES AND PROCEDURES AND TO DETERMINE UNDER WHAT CIRCUMSTANCES IT IS COST EFFECTIVE TO CANCEL OR TERMINATE EXCESS PROCUREMENTS. THIS REPORT SUMMARIZES THE CURRENT POLICIES AND DESCRIBES AN ANALYTIC MODEL WHICH: (1) STANDARDIZES AND STREAMLINES THE TERMINATION PROCESS; (2) GIVES VISIBILITY OF DEPOT STORAGE AND HANDLING COSTS; (3) IDENTIFIES CANDIDATES FOR ECONOMIC TERMINATION; AND (4) IF IMPLEMENTED, WOULD REDUCE THE VALUE OF EXCESS ON-ORDER MATERIAL AND AVOID UNNECESSARY STORAGE AND HANDLING COSTS.

14. SUBJECT TERMS
Procurement, Forecasting, Excess Material

15. NUMBER OF PAGES
34

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	